

REMARKS

This application has been reviewed in light of the Office Action dated March 1, 2004. Claims 1-10 and 16-35 are now presented for examination. Claims 7, 10, 20, 21, 22, 23, 26, 28 and 29 have been amended to define more clearly what Applicant regards as his invention. Claims 31-35 have been added to provide Applicant with a more complete scope of protection. Claims 1, 10, 20, 26 and 31 are in independent form. Favorable reconsideration is requested.

The Examiner is thanked for the indication that Claims 10 and 16-19 are allowed.

Claims 23 and 29 were objected to, but would be allowed if rewritten in independent form, with no change in scope, according to the Office Action. Those claims have not been so rewritten at this time, because the respective base claims from which they depend are believed to be patentable.

Claim 1 has been rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,956,578 (Shimizu et al.). Claims 2-5 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shimizu et al. in view of U.S. Patent No. 6,135,839 (Iwase et al.). Claims 6-9 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Shimizu et al. in view of U.S. Patent No. 5,770,918 (Kawate et al.). Claims 20-22, 24-26, 28, and 30 have been rejected under 35 U.S.C. §103(a) as being

unpatentable over U.S. Patent No. 5,185,554 (Nomura et al.) in view of U.S. Patent No. 5,973,444 (Xu et al.).¹

Claim 1 is directed to an electron-emitting apparatus comprising an electron-emitting device including a first electrode, a second electrode that is provided so as to be insulated from the first electrode, and an electron-emitting film attached to the second electrode and insulated from the first electrode. An anode is provided at a predetermined distance from the electron-emitting film, wherein the first electrode, the second electrode, and the electron-emitting film oppose the anode, such that a distance between the anode and the electron-emitting film is longer than a distance between the anode and the second electrode, and a distance between the anode and the first electrode is longer than the distance between the anode and the electron-emitting film.

At page 2, the Office Action asserts that “In figures 2 and 8A, Shimizu shows an electron- emitting film(4) attached to the second electrode and insulated from the first electrode via an insulating material(13)” However, this assertion is respectfully disagreed with. Referring to Fig. 8A of Shimizu et al., in the device disclosed therein an electron-emitting film (4) is connected through a high potential electrode (1) to a first electrode (14) (see col. 5, lines 31-41). According to Shimizu et al., the electron-emitting film (4) is connected to a high-potential electrode and to a low-potential electrode.

1/ The Office Action does not explicitly state that Claim 27 is rejected, but addresses that claim in the context of the foregoing rejection (see section 21 of the Office Action).

These features also are represented in Claims 1, 7, 12, 17, and 22 of Shimizu et al.

According to an aspect of the invention to which Claim 1 of the present application relates, on the other hand, the electron-emitting film is attached to the second electrode and insulated from the first electrode. These features are supported in Fig.1, although of course Claim 1 should not be construed as being limited only to the embodiment depicted in that drawing. Nothing in Shimizu et al. would teach or suggest the foregoing features of Claim 1, and therefore the claim is believed to be clearly patentable over Shimizu et al.

The rejection of independent Claim 20 will now be addressed.

Claim 20 recites, in part, a first power source for applying a necessary electric field, to cause an electron emission from the plurality of carbon fibers, at least between the anode and the second electrode. In the electron-emitting apparatus according to claim 20, the electric field is applied between the anode and the second electrode on which the plurality of carbon fibers are disposed to cause the electron emission from the carbon fibers.

In the electron-emitting apparatus of Nomura et al. (shown in Fig. 3), on the other hand, a voltage is applied between the electrodes 35 to emit an electron therefrom. In an image forming apparatus comprising the electron-emitting device in Nomura et al., an anode electrode is disposed over the electron-emitting device so that a voltage on the anode electrode extracts the electron emitted by the voltage applied between the two electrodes. However, nothing in Nomura et al. would teach or suggest applying, at least between the

anode and the second electrode, an electric field necessary to cause the electron emission from a plurality of carbon fibers, as set forth in Claim 20.

Also, in the apparatus depicted in Fig. 10 of Xu et al., at the time of extracting an electron from a carbon fiber 308, an electric field is applied between a cathode electrode 305 and a gate electrode 306 to cause such electron emission. Such extracted electron is further extracted by a voltage of an anode electrode 303. Thus, like Nomura et al., Xu et al. also discloses applying to the anode electrode an electric field necessary to cause the electron emission from an electron emission member. However, nothing in Xu et al. would teach or suggest applying, at least between the anode and the second electrode, an electric field necessary to cause the electron emission from a plurality of carbon fibers, as set forth in Claim 20.

Accordingly, even if Nomura et al. and Xu et al. were to be combined as postulated in the Office Action (which, in any event, is not admitted as being obvious or technically feasible), the resulting combination also would not teach or suggest those features.

Furthermore, the Office Action states that “Nomura and Xu are both silent to the exact configuration of the power sources for applying the necessary electric fields, having Applicant’s recited power source wiring is an obvious configuration for an operable electron emitting apparatus. One would be motivated to wire an electron emitting device in such a configuration for a variety of reasons, including material availability, space requirements, and the presence of delicate elements with stringent power

requirements.” However, MPEP § 2143 clearly states that, in order to establish a *prima facie* case of obviousness against a claim, “the prior art reference (or references when combined) must teach or suggest all the claim limitations.” Because for the reasons given above, neither Nomura et al. nor Xu et al. teaches or suggests applying at least between an anode and a second electrode an electric field necessary to cause the electron emission from a plurality of carbon fibers, as set forth in Claim 20, the postulated combination of those references cannot possibly support a *prima facie* case of obviousness against Claim 20. Thus, for these reasons as well, it is believed that the Office Action has failed to establish a *prima facie* case of obviousness against Claim 20, and the claim is therefore believed to be clearly patentable over Nomura et al. and Xu et al., whether considered separately or in combination.

Independent Claim 26 will now be addressed.

Claim 26 recites, in part, a first power source for applying a necessary electric field, to cause an electron emission from the electron-emitting film, at least between the anode and the second electrode. That is, in the electron-emitting apparatus of Claim 26, an electric field is applied between the anode and the second electrode (attached to the electron-emitting film) necessary to cause the electron emission from the carbon fibers.

According to Nomura et al., in the electron-emitting apparatus of Fig. 3, a voltage is applied between two electrodes 35 to cause an electron emission. In an image forming apparatus comprising the electron-emitting apparatus of Nomura et al., an anode is

disposed over the electron-emitting device, the voltage is applied between the two electrodes 35 to emit an electron therefrom, and the electron already emitted is then extracted up to the anode electrode. That is, the anode electrode voltage is not to produce the electric field to *cause* the electron emission from an electron emission member itself, but instead is employed to extract the electron up to the anode electrode.

Moreover, in the apparatus shown in Fig. 10 of Xu et al., in extracting an electron from a carbon fiber 308, an electric field is applied between a cathode electrode 305 and a gate electrode 306. Then the extracted electrode is moved up by a voltage of an anode electrode 303. However, Like Nomura et al., Xu et al. also does not teach or suggest a first power source for applying a necessary electric field, to cause an electron emission from an electron-emitting film, at least between the anode and the second electrode, as recited in Claim 26.

Accordingly, Claim 26 is deemed to be clearly patentable over those references, whether considered separately or in combination.

Added independent Claim 31 recites:

“31. An electron-emitting device comprising:
a first electrode arranged on a surface of a substrate;
an insulating layer arranged on the first electrode;
a second electrode arranged on the insulating layer; and
a plurality of carbon fibers arranged on the second electrode,
wherein each carbon fiber comprises a plurality of graphenes stacked
in a direction that is not perpendicular to an axis direction of the fiber, and
wherein the plurality of carbon fibers are arranged on the second
electrode so that the plurality of carbon fibers are close to a part of an outer periphery of
the second electrode.”

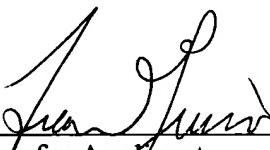
It is respectfully submitted that nothing in either Shimizu et al., Nomura et al., or Xu et al., would teach or suggest an electron-emitting device having the foregoing features, and thus Claim 31 is deemed clearly patentable over those references, whether considered separately or in combination.

The other claims in this application are each dependent from one or another of the independent claims discussed above and are therefore believed patentable for the same reasons. Since each dependent claim is also deemed to define an additional aspect of the invention, however, the individual consideration or reconsideration, as the case may be, of the patentability of each on its own merits is respectfully requested.

In view of the foregoing amendments and remarks, Applicant respectfully requests favorable reconsideration and early passage to issue of the present application.

Applicant's undersigned attorney may be reached in our New York office by telephone at (212) 218-2100. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,



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